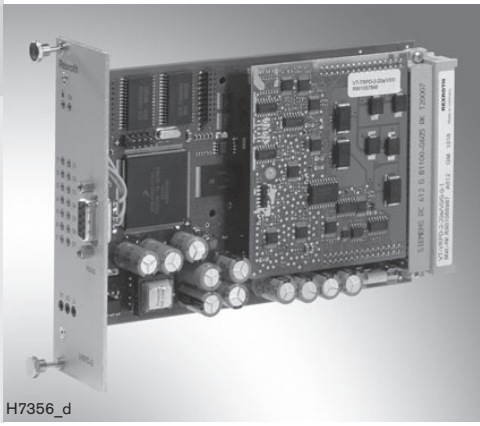
Digital valve amplifier for valve types 4WRE 6 ..., component series 2X 4WRE 10 ..., component series 2X

RE 30126/09.07 1/10
Replaces: 09.05

Typ VT-VRPD-2


H7356_d

Component series 2X

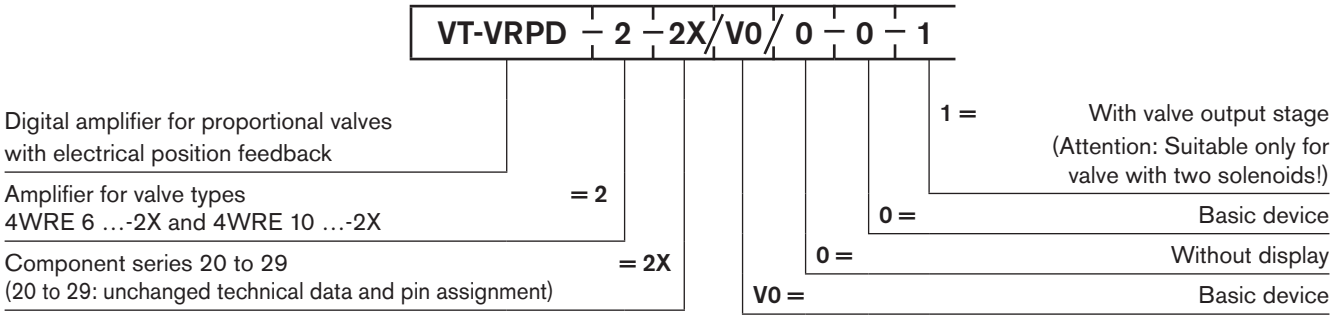
Table of contents

Content	Page
Features	1
Ordering code	2
Functional description	3
Block circuit diagram	4
Technical data	5 and 6
Pin assignment of multi-point connector	7
Pin assignment of D-SUB Buchse	8
Unit dimensions	8
Engineering / maintenance notes / supplementary information	9

Features

- Suitable for controlling proportional valves with electrical position feedback, types:
  4WRE 6, component series 2X
  4WRE 10, component series 2X
- User data can be exactly reproduced and are protected against unintended or unauthorized changes
- Use of a powerful microcontroller
- Valve selection using operating software BODAC
- Command value input, optional as voltage or current interface
- Voltage input as differential input
- Command value input with variable input adjustment
- Ramp generator
- Digital inputs for calling pre-set command value parameters
- Enable input and fault output
- Switched-mode power supply unit for internal supply voltages
- Freely configurable measuring sockets X2 (X1 positively assigned to actual valve value)
- Configuration and parameterization via serial interface using PC software BODAC (CD:SYS-HACD-BODAC-01)
  Connection cable for BODAC
- Up to 32 valve amplifiers can be interconnected via local bus for parameterization and diagnostics purposes

Ordering code


VT-VRPD – 2 – 2X/V0/ 0 – 0 – 1
Digital amplifier for proportional valves with electrical position feedback
Amplifier for valve types 4WRE 6 …-2X and 4WRE 10 …-2X
= 2
Component series 20 to 29 (20 to 29: unchanged technical data and pin assignment)
= 2X
V0 = Basic device
0 = Without display
0 = Basic device
1 = With valve output stage (Attention: Suitable only for valve with two solenoids!)

Standard types	Material number
VT-VRPD-2-2X/V0/0-0-1	R901066987

Required accessories:

- PC program BODAC: Ordering code of CD: SYS-HACD-BODAC-01 (R900777335) or free download on the Internet at www.boschrexroth.com/hacd
- Interface cable: Cable set VT-HACD-1X/03.0/ HACD-PC (R900776897) or commercial 1:1 cable

Suitable card holders:

- 19“ racks VT 19101, VT 19102, VT 19103 and VT 19110 (see RE 29768)
- Enclosed card holder VT 12302 (see RE 30103) (standard), Mat. no. R900784153
- Open card holder VT 3002-2X/64G (see RE 29928), Mat. no. R900991843 (only for installation into control cabinet!)
- Connection adapter VT 10812-2X/64G (see RE 30105), Mat. no. R900713826

Functional description

The amplifier card is designed as double-sided printed-circuit board in Euro-format 100 x 160 mm with daughterboard.

A microcontroller is the central unit of the amplifier. It controls the entire sequence and implements closed-loop position control. Data for the configuration, command value feedforward, and parameters are saved in a non-volatile FLASH.

Four binary-coded, digital inputs are used for calling up parameter sets (command values) from the memory, in which a maximum of 16 sets can be saved. A call-up activates the command value for the valve spool position with the associated ramp times.

Further control inputs have the following function:

"Command valid":	Enable of the parameter set addressed by the current call-up (H-active)
"Enable":	Activation of outputs (fault message acknowledgement by Low→High edge)

The amplifier card includes a controller for the spool position of a proportional valve.

The command value can be provided via digital command value call-ups [5] and/or via analog inputs [1]. Analog input AI4 (b14/b16) must be used for command values of ±10 V, analog input AI6 (b22/b24) for command values of 4 to 20 mA.

Command values of 0 to +10 V (12...20 mA) control solenoid B.

Command values of 0 to −10 V (4...12 mA) control solenoid A.

The digital command value is added to the analog command value with the correct sign in accordance with the set call-up.

The signal level of the command value inputs can be varied by means of the software.

Apart from the possibility of generating ramps internally, it is possible to influence "up" and "down" ramps of external signals with correct sums and signs via analog inputs AI2 (b6/b9) and AI5 (b18/b20).

For 4WRE valves, a step function generator [9] is provided by the software to realize an overlap jump when a spool with overlap is selected. The command value sum is fed to the controller [12].

The actual valve value (b26) is generated by means of an oscillator/demodulator stage from the valve position measuring system and also fed to the controller [12]. The controller output controls the current-regulated output stages.

Enable and fault messages

The closed-loop control is activated by a H-level at the enable input. If no command value call-up is active, digital call-up 0 is set.

A fault logic [14] recognizes control deviations, a cable break of actual value cables and of the command value input for 4 to 20 mA as well as an inactive enable input. In the case of a fault, a fault message is output to (d22) by a Low signal and signaled visually by LED "OK" (OK goes out) on the front panel. It is possible to configure the enable so that an inactive enable input is not signaled as a fault.

Parameterization and diagnosis

The selection of the valve to be controlled and the selection and configuration of the command value input, the ramp generator, the enable input, and the setting of the command value call-up parameters are made via the serial interface [6] at the front D-SUB socket [7]. Up to 32 valve amplifiers can be interconnected via the local bus. A bus address is assigned to each valve amplifier via BODAC. Re-plugging of the serial interface cable is not required.
For further information, see RE 30126-01-B.

Digital outputs

DO 1	(d20)	Solenoid A active
DO 2	(d26)	Solenoid B active
DO 3	(z22)	System deviation ≥ window
DO 4	(z24)	Freely configurable
DO 5	(z26)	Freely configurable
DO 6	(z28)	Freely configurable
DO 7	(f2)	Not assigned

Indicator elements and measuring sockets

The front panel of the command value card is provided with measuring sockets for the two analog outputs.

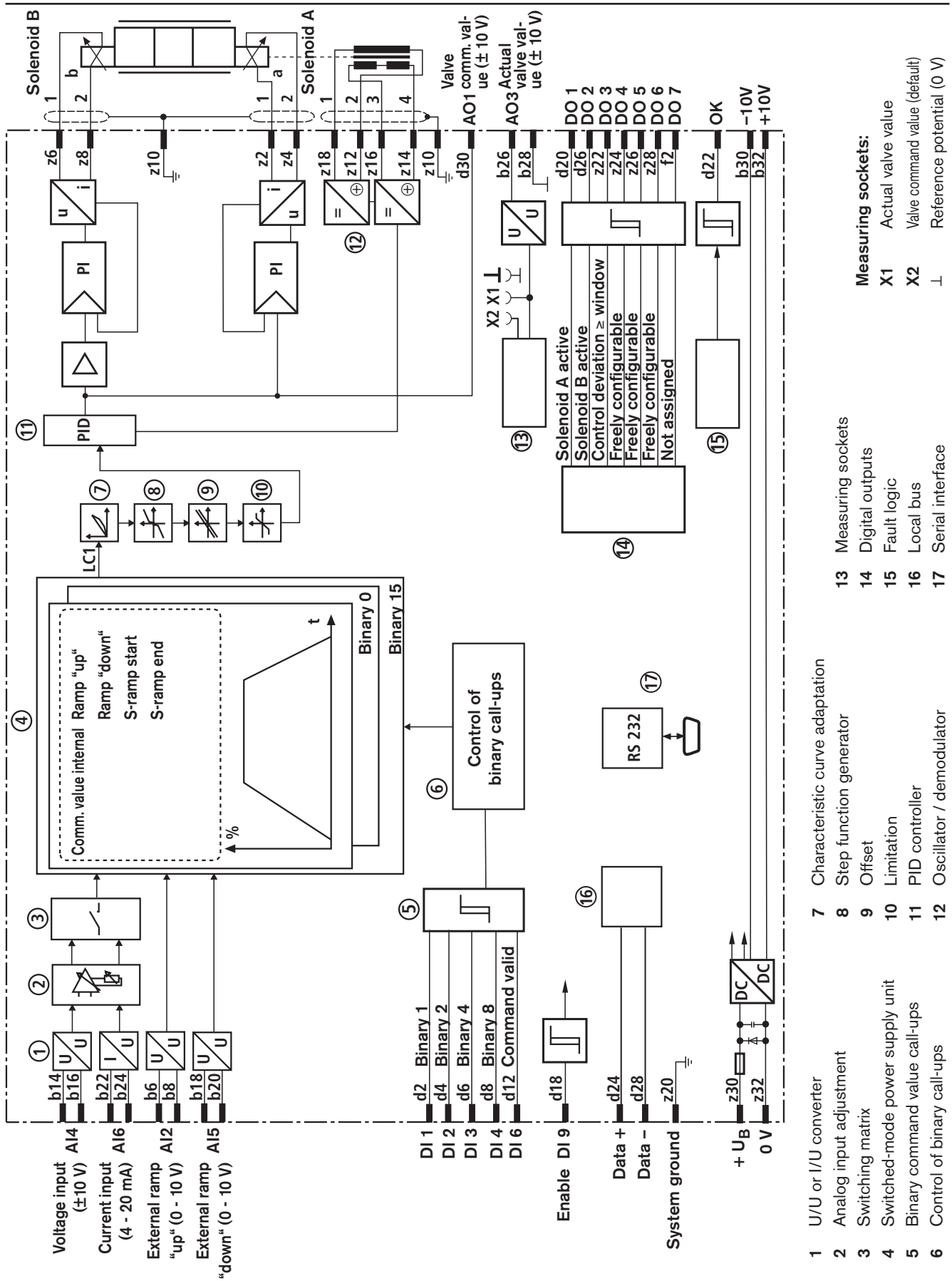
Measuring socket "X1":	Actual valve value (b26)
Measuring socket "X2":	Valve command value (default)
Measuring socket "⊥":	Reference potential (corresponds to connection z32)

The following states are signaled by LEDs:

LED "🔓" (green):	Enable active
LED "OK" (green):	OK ready for operation
LEDs "I1"..."I4" (yellow):	Binary-coded command value call-ups
LED "I6" (yellow)	Command valid
LED "I5, I7" (yellow)	Not assigned

[ ] = Cross-reference to block circuit diagram on page 4

Block circuit diagram



1 U/U or I/U converter
2 Analog input adjustment
3 Switching matrix
4 Switched-mode power supply unit
5 Binary command value call-ups
6 Control of binary call-ups
7 Characteristic curve adaptation
8 Step function generator
9 Offset
10 Limitation
11 PID controller
12 Oscillator / demodulator
13 Measuring sockets
14 Digital outputs
15 Fault logic
16 Local bus
17 Serial interface

Measuring sockets:
X1 Actual valve value
X2 Valve command value (default)
⊥ Reference potential (0 V)

Technical data (for applications outside these parameters, please consult us!)

Valve amplifier VT-VRPD-2-2X/V0/0-0-1

Operating voltage	U_B	24 VDC + 40 % – 10 %
Operating range		
Upper limit value	$u_B(t)_{max}$	35 V
Lower limit value	$u_B(t)_{min}$	21 V
Current consumption	I_{max}	1.5 A; stand-by current 270 mA
Fuse	I_S	4 A slow-blowing
Digital inputs	Signal	log 0 = 0 to 5 V
		log 1 = 16 V to U_B
Digital outputs	Signal	log 0 = 0 to 5 V
		log 1 = U_B – 3 V
		I_{max} = 30 mA, short-circuit-proof
Analog inputs		
Voltage input AI4, AI2 and AI5		
Range	U	±10 V
Input resistance	R_e	100 kΩ, > 10 MΩ for input AI2
Resolution		5 mV for range ±10 V
		2.5 mV for range 0...10 V
Non-linearity		< 10 mV
Current input (AI6 only)		
Range	I	4...20 mA
Input resistance	R_e	100 Ω
Current loss		0.15 % (at 500 Ω between Pin b24 and 0 V)
Resolution	I	5 µA
Analog outputs		
Voltage outputs AO1 and AO3		
Output voltage	U	±10 V
Load	R_{Lmin}	1 kΩ
Resolution	U	1.25 mV (14 bit)
Residual ripple content		±15 mV (without noise)
Ramp time	s	max. 300
Valve output stage		
Solenoid current per solenoid	I_{max}	2.5 A
Reference voltage	U	±10 V, 30 mA, short-circuit-proof
Residual ripple content		< 20 mV
Oscillator frequency	f	5.7 kHz
Scan time for command value conditioning	t	2 ms
Serial interface		RS 232 (front panel), D-Sub socket
Type of connection		64-pin multi-point connector, DIN 41612, form G
Local bus, distance to most distant station	l	max. 280 m cable length
Card dimensions		Euro-card 100 x 160 mm, DIN 41494
Front panel dimensions		
Height		3 HE (128.4 mm)
Width soldering side		1 TE (5.08 mm)
Width component side		7 TE
Permissible operating temperature range	ϑ	0 to 50 °C
Storage temperature range	ϑ	–20 to +70 °C
Weight	m	0.2 kg

Note:

For details regarding **environment simulation testing** in the fields of EMC (electromagnetic compatibility), climate and mechanical stress, see RE 30126-U (declaration on environmental compatibility).

Technical data (for applications outside these parameters, please consult us)

Valve 4WRE…-2X (not included in the scope of supply)

Solenoid		
Current consumption per solenoid	I_{max}	2.5 A
Solenoid coil resistance		
Cold value at 20 °C	R	2.7 Ω
Max. warm value	R	4.5 Ω
Electrical connection		Plug-in connection to DIN EN 175301-803
Type of protection to EN 60529		IP 65 with mating connector correctly mounted and locked
Position transducer		
Carrier frequency	f	5 kHz
Coil resistance (at 20 °C):		
Between connections 1 and 2	R	113 Ω
Between connections 3 and 4	R	101 Ω
Electrical connection		Plug-in connection to DIN 43650-BFZ-Pg9
Type of protection to EN 60529		IP 65 with mating connector correctly mounted and locked

Pin assignment of multi-point connector

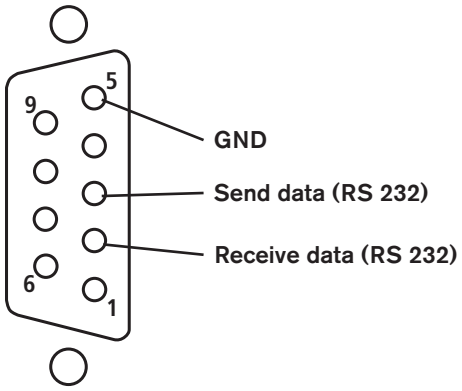
Row d		
Pin	**Code**	**Description**
2	DI 1	Binary 1
4	DI 2	Binary 2
6	DI 3	Binary 4
8	DI 4	Binary 8
10	DI 5	n. c.
12	DI 6	Command valid
14	DI 7	n. c.
16	DI 8	n. c.
18	DI 9	Enable
20	DO 1	Solenoid A active
22	OK	OK output
24	Data+	Local bus
26	DO 2	Solenoid B active
28	Data–	Local bus
30	AO 1	Valve command value
32	AO 2	n. c.

Row b		
Pin	**Code**	**Description**
2	n. c.	n. c.
4	n. c.	n. c.
6	AI 2+	Ramp + (U)+
8	AI 2–	Ramp + (U)–
10	n. c.	n. c.
12	n. c.	n. c.
14	AI 4+	Command value (U)+
16	AI 4–	Command value (U)–
18	AI 5+	Ramp – (U)+
20	AI 5–	Ramp – (U)–
22	AI 6+	Command value (I)+
24	AI 6–	Command value (I)–
26	AO 3	Actual valve value ±10V
28	AGND	Analog GND
30	REF–	–10 V
32	REF+	+10 V

Row z		
Pin	**Code**	**Description**
2	MA+	Solenoid A+
4	MA–	Solenoid A–
6	MB+	Solenoid B+
8	MB–	Solenoid B–
10	Shield	Shield
12	L 1O–	LVDT supply –, Pin 2
14	L 1I–	LVDT signal –, Pin 4
16	L 1I+	LVDT signal +, Pin 3
18	L 1O+	LVDT supply +, Pin 1
20	System ground	System ground
22	DO 3	System deviation ≥ window
24	DO 4	Freely configurable
26	DO 5	Freely configurable
28	DO 6	Freely configurable
30	UB	Supply voltage
32	LO	Ground

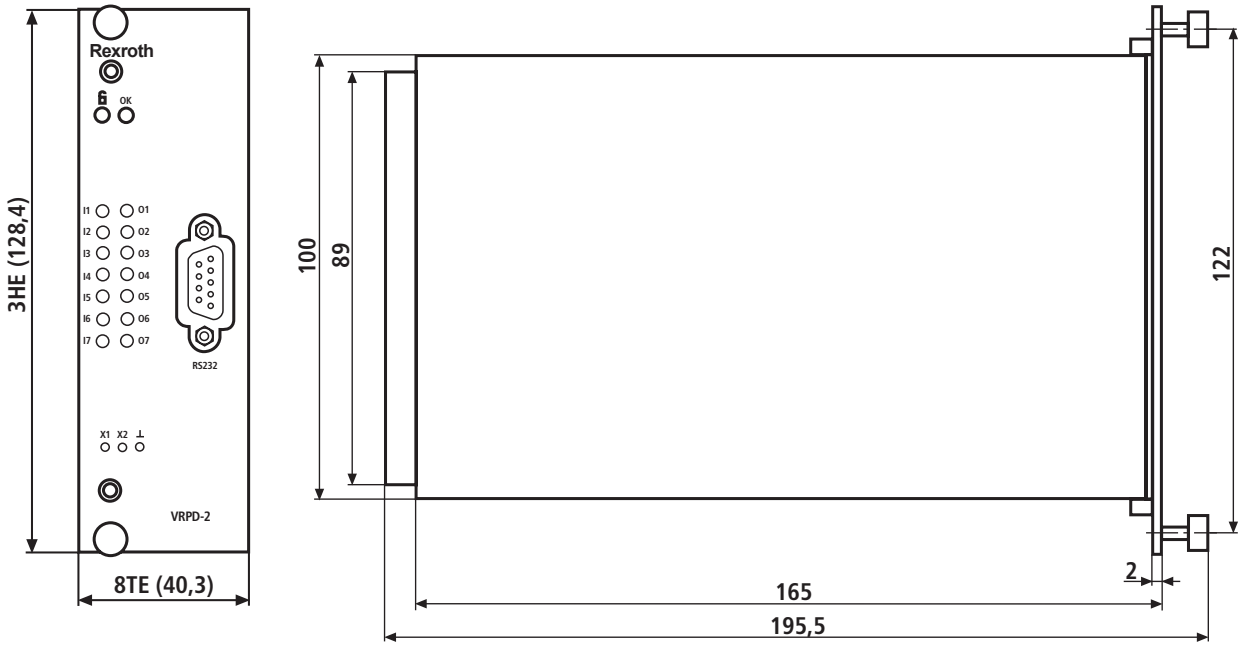
Row f		
Pin	**Code**	**Description**
2	DO 7	n. c.
4	n. c.	n. c.
6	n. c.	n. c.
8	n. c.	n. c.
10	n. c.	n. c.
12	n. c.	n. c.
14	n. c.	n. c.
16	n. c.	n. c.
18	n. c.	n. c.
20	n. c.	n. c.
22	n. c.	n. c.
24	n. c.	n. c.
26	n. c.	n. c.
28	n. c.	n. c.
30	n. c.	n. c.
32	n. c.	n. c.

Pin assignment of D-SUB socket



RS 232

Unit dimensions (dimensions in mm)



Engineering / maintenance notes / supplementary information

Product documentation for valve amplifier VT-VRPD-2-2X/V0/0-0-1

- RE 30126
  Technical data sheet (the present document)
- RE 30126-B
  Installation and operating instructions
- RE 30126-01-B
  Commissioning and operating instructions
- RE 30126-U
  Declaration on environmental compatibility
- RE 30126-Z
  Supplementary information for the replacement of VT-VRPD-2-1X by VT-VRPD-2-2X

– The amplifier card may only be plugged or withdrawn when disconnected from the power supply!
– Do not use plugs with free-wheeling diodes or LED indicator lamps for connecting the solenoids!
– Measurements on the card may only be taken using instruments $R_i > 100\ k\Omega$!
– Use relays with gold-plated contacts for passing on command values (small voltages, small currents)!
– Route command value cables separately and always shield them; connect shield to connection z10 on the card side and leave the other end open (risk of earth loops)!
– For solenoid cables up to 50 m length, use cable type LiYCY 1.5 mm^2. In the case of greater lengths, please consult us!
  Recommendation: Also shield solenoid cables!
– Use highly flexible Cu cables (min. 2.5 mm^2) for connecting the system ground!
  The system ground is an integral part of EMC protection of the valve amplifier. It is intended to discharge interference that is transported via the data and supply cables. This is only possible, when the system ground itself does not inject interference into the command value card.
– The distance to aerial lines, radio sources and radar equipment must be at least 1 m!
– Do not lay solenoid and signal cables near power cables!
– Due to the charging current of the smoothing capacitor on the card, back-up fuses must have slow-blowing characteristics!
– **Caution:** When the **differential input** is used, **both inputs** must always be switched on or off **simultaneously.**

Note: Electrical signals brought out via control electronics (e.g. signal “OK”) must not be used for switching safety-relevant machine functions!
(See also European standard “safety requirements for fluid power systems and components - hydraulics”, EN 982)

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

© This document, as well as the data, specifications and other information set forth in it, are the exclusive property of Bosch Rexroth AG. It may not be reproduced or given to third parties without its consent.
The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

© This document, as well as the data, specifications and other information set forth in it, are the exclusive property of Bosch Rexroth AG. It may not be reproduced or given to third parties without its consent.
The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

© This document, as well as the data, specifications and other information set forth in it, are the exclusive property of Bosch Rexroth AG. It may not be reproduced or given to third parties without its consent.
The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.